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Growth and yield response of sesame (*sesamum indicum L.*) variety s-9 under foliar nitrogen doses at different application times

Jagdesh Kumar[1], Rajesh Kumar Oad[1], Ghulam Mustafa Laghari[1], Dilpat Rai Menghwar[2]

[1]*Department of Agronomy Faculty of Crop Production, Sindh Agriculture University Tandojam.*
[2]*Department of Animal Sciences, Faculty of Biological sciences, Quaid-i-Azam University Islamabad.*

Abstract

Present study was carried out to determine the yield and growth of sesame (*sesamum indicum L.)* variety S-9 under foliar nitrogen doses at different application times at Sindh Agriculture University Tandojam. The experiment had been placed in a Randomized Complete Block Design with net plot size ($6m^2$) with three replication. The sesame variety S-9 was used and checked under various foliar nitrogen doses at different application time treatments i.e. T_1= N @ 00 kg ha^{-1} (control), T_2= N @ 0.5 kg ha^{-1} (30 DAS), T_3= N @ 0.5 kg ha^{-1} (45 DAS), T_4= N @ 0.5 kg ha^{-1} (60 DAS), T_5= N @ 1.0 kg ha^{-1} (30 DAS), T_6= N @ 1.0 kg ha^{-1} (45 DAS), T_7= N @ 1.0 kg ha^{-1} (60 DAS), T_8= N @ 1.5 kg ha^{-1} (30 DAS), T_9= N @ 1.5 kg ha^{-1} (45 DAS), T_{10}= N @ 1.5 kg ha^{-1} (60 DAS). The results revealed that maximum values for sesame traits under study were i.e. Plant height (122.38 cm), Branches $plant^{-1}$ (34.45), Capsules $plant^{-1}$ (194.60), capsule length (2.65 cm), Seeds $capsules^{-1}$ (56.3), Seed wt $plant^{-1}$ (76.31 g), Seed index (5.69, 1000 seed wt g), Seed yield (1233.3 kg ha^{-1}), Harvest index (11.12%), were recorded under treatment T_{10}= N @ 1.5 kg ha^{-1} (60 DAS), whereas; minimum values for various sesame traits i.e. Plant height (80.57 cm), Branches $plant^{-1}$ (15.47), Capsules $plant^{-1}$ (130.31), Capsules length (1.30 cm), Seeds $capsules^{-1}$ (30.5), Seed wt $plant^{-1}$ (50.57 g), Seed index (3.34, 1000 seed wt g), Seed yield (711.7 kg ha^{-1}), Harvest index (6.23%), in control treatment where no foliar nitrogen doses was applied. It was concluded that growth and yield increased at T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) and thus recommended for better performance and yield of sesame crop.

Key words: sesame, Yield, foliar, nitrogen, Application

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Corresponding author:
dilpatrai@qau.edu.pk

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1. INTRODUCTION

Sesame (*Sesamum indicum* L.) seed comprises with the most fatty acid like omega linoleic acid and omega three linoleic acid. Also it is good sources of minerals like phosphorus and calcium and vitamin E. Elevation whole product of oil crops predominantly sesame for tapering oil lack cavity is the goal. Sandy soil faces to many problems like loss of nutrients by fixation[1]. N is the utmost vital macro-nutrient. Which is essential for amino acid, protein, ribosomes, nucleic acid, co-enzymes, cytochrome, chlorophyll and

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vitamins synthesis[2]. Many scientist highlighted the progressive effect of apply N fertilizer on growth, seeds yield, quality of sesame and yield qualities. Submission of 46 kg N ha^{-1} augmented the branches and capsules $plant^{-1}$ also seeds per capsule[3].

Fertilizer submission technique also manipulates stimulant. Used competent nitrogen appliance resulted in elevated yields. N-P-K manure resulted in parallel cotton yields[4]. As most of the nutrients are applied using a complex fertilizer at the time of sowing or planting, it is a good practice to apply the fertilizer as placement. Micronutrients are mostly applied as foliar sprays[5]. Fertilizer application method influences the crop markedly; in some cases fumigation is more effective than other techniques; but under normal field conditions, but band placement can reduce fertilizer application costs by eliminating an operation and improving nutrient efficiency. The sunflower yields were higher when N and P fertilizers were used by band placement method produced better results in regards to sunflower foliage and seed yield as compared to broadcast NP application[6].

The current conduct trial was conducted to examine the enlargement and yield of Sesame to NPK foliar application under agro-ecological conditions of Tandojam Sindh.

2. MATERIALS AND METHODS

2.1 Site and Area of Selection

The trial was conducted at experiment Agriculture Farm Department of Agronomy Faculty of Crop Production Sindh Agriculture University Tandojam during 2014-2015. All the crop practices were adopted according to recommendations of ARI Tandojam.

2.2 Agronomical practices

For this experimental purpose the land was given one deep ploughing by using disk plough followed by disk harrow to eradicate the weeds and uniform distribution of irrigation water. A four inches of irrigation water on socking dose was applied when land came in condition cultivation was practiced followed by rotavator, then levelling was done. A good well pulverized seed bed was prepared. There were thirty plots each plot consist an area of about 3m x 2m = $6m^2$. Recommenced dose of NPK applied in the farm of urea with SSP. The full dose of phosphorus with 1/3 of N was applied at the time of seedbed preparation while the remaining N was split and top dressed at various crop development stages which contained 250 liters per hectare of water. All the necessary cultural operation was followed throughout the growing period.

2.3 The experimental details as under

Experimental design= Randomized complete block design (RCBD), Replication= Three, Net plot size= 3m x 2m= $6m^2$, Variety= S-9, Treatments= Foliar nitrogen doses =10

T_1= N @ 00 kg ha^{-1} (control), T_2= N @ 0.5 kg ha^{-1} (30 DAS), T_3= N @ 0.5 kg ha^{-1} (45 DAS), T_4= N @ 0.5 kg ha^{-1} (60 DAS), T_5= N @ 1.0 kg ha^{-1} (30 DAS), T_6= N @ 1.0 kg ha^{-1} (45 DAS), T_7= N @ 1.0 kg ha^{-1} (60 DAS), T_8= N @ 1.5 kg ha^{-1} (30 DAS), T_9= N @ 1.5 kg ha^{-1} (45 DAS), T_{10}= N @ 1.5 kg ha^{-1} (60 DAS)

2.4 Statistical analysis:

The data collected was subjected to analysis of variance using MSTAT-C computer software (Russel and Eisensmith, 1983). The LSD test will be applied to discriminate treatments superiority, where necessary.

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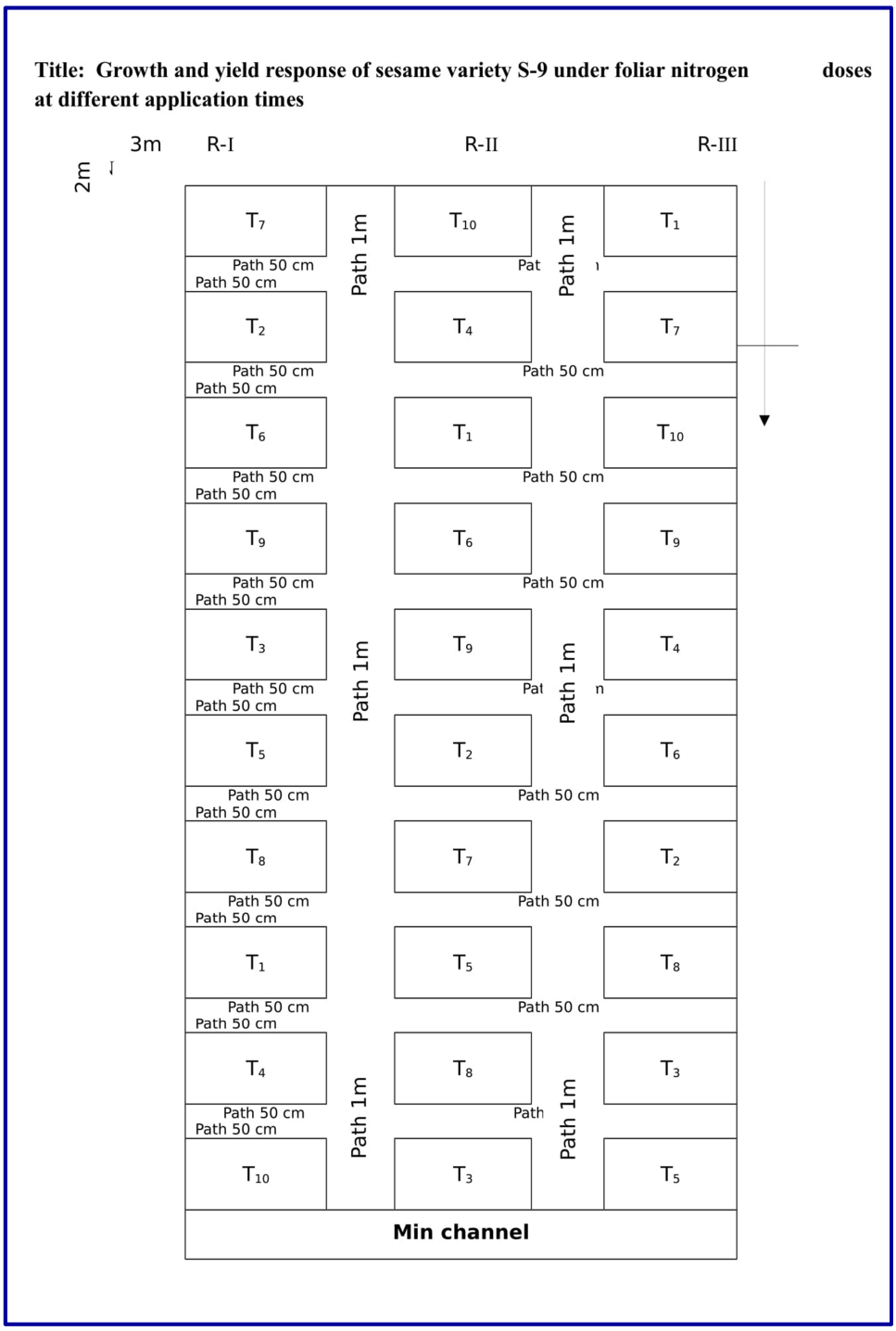

3. RESULTS AND DISCUSSIONS

The study was aimed to find the treatments influence on individual traits such as plant height (cm), branches plant^{-1}, capsules plant^{-1}, capsules length (cm), seeds capsules^{-1}, seed wt plant^{-1} (g), seed index (1000 seed wt g), seed yield (kg ha^{-1}) and harvest index (%).

3.1 Plant height (cm)

The result regarding plant height (cm) of sesame are presented in Table-1.Results indicated that treatments had significant effect on plant height (cm). It was further found that application of T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) recorded maximum plant height (122.38 cm), followed by T_9= N @ 1.5 kg ha^{-1} (45 DAS)

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(119.28 cm) and T_8= N @ 1.5 kg ha^{-1} (30 DAS) (118.70 cm) respectively. The lowest plant height (80.57 cm) was observed under control plot where no foliar nitrogen was applied.

3.2 Branches plant^{-1}

The results regarding branches plant^{-1} of sesame are shown in table-2. It was observed that application of foliar nitrogen applied at T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) recorded maximum branches (34.45) plant^{-1} followed by T_7= N @ 1.0 kg ha^{-1} (60 DAS) (33.94) and T_9= N @ 1.5 kg ha^{-1} (45 DAS) (33.68) respectively. However lower branches plant^{-1} (15.47) was observed under control treatment where no foliar nitrogen was applied.

3.3 Capsules plant^{-1}

The results regarding capsules plant^{-1} of sesame are shown in table-3. It was observed that foliar nitrogen applied at T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) recorded maximum capsules (194.60) plant^{-1} followed by T_7= N @ 1.0 kg ha^{-1} (60 DAS) (191.48) and T_4= N @ 0.5 kg ha^{-1} (60 DAS) (190.68) respectively. However lower (130.31) capsules plant^{-1} was observed under control treatment where no foliar nitrogen was applied.

3.4 Capsules length (cm)

The results regarding capsules length (cm) of sesame are shown in table-4. It was observed that foliar nitrogen applied at T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) recorded maximum capsules length (2.65 cm) followed by T_9= N @ 1.5 kg ha^{-1} (45 DAS) (2.63 cm) and T_8= N @ 1.5 kg ha^{-1} (30 DAS) (2.53 cm) respectively. However lower (1.30 cm) capsules length was observed under control treatment where no foliar nitrogen was applied.

3.5 Seed capsules^{-1}

The results regarding Seed capsules^{-1} of sesame are shown in table-5. It was observed that foliar nitrogen applied at T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) recorded maximum Seed (56.3) capsules^{-1} followed by T_9= N @ 1.5 kg ha^{-1} (45 DAS) (52.9) and T_7= N @ 1.0 kg ha^{-1} (60 DAS) (52.7) respectively. However lower (30.5) Seed capsules^{-1} was observed under control treatment where no foliar nitrogen was applied.

3.6 Seed wt plant^{-1} (g)

The results regarding Seed wt plant^{-1} (g) of sesame are shown in table-6. It was observed that foliar nitrogen applied at T_7= N @ 1.0 kg ha^{-1} (60 DAS) recorded maximum Seed wt plant^{-1} (76.31g) followed by T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) (71.02g) and T_9= N @ 1.5 kg ha^{-1} (45 DAS) (69.64g) respectively. However lower (50.57g) Seed wt plant^{-1} (g) was observed under control treatment where no foliar nitrogen was applied.

3.7 Seed index (1000 seed wt g)

The results regarding Seed index (1000 seed wt g) of sesame are shown in table-7. It was observed that foliar nitrogen applied at T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) recorded maximum Seed index (1000 seed wt g) (5.69g) followed by T_9= N @ 1.5 kg ha^{-1} (45 DAS) (5.66g) and T_7= N @ 1.0 kg ha^{-1} (60 DAS) (5.33g) respectively. However lower (3.34g) Seed index (1000 seed wt g) was observed under control treatment where no foliar nitrogen was applied.

3.8 Seed yield (kg ha^{-1})

The results regarding Seed yield (kg ha^{-1}) of sesame are shown in table-8. It was observed that foliar nitrogen applied at T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) recorded maximum Seed yield (1233.3 kg ha^{-1}) followed by T_7= N @ 1.0 kg ha^{-1} (60 DAS) (1181.7 kg ha^{-1}) and T_9= N @ 1.5 kg ha^{-1} (45 DAS) (1151.7 kg ha^{-1}) respectively. However lower (711.7 kg ha^{-1}) Seed yield (kg ha^{-1}) was observed under control treatment where no foliar nitrogen was applied.

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3.9 Harvest index (%)

The results regarding Harvest index (%) of sesame are shown in table-9. It was observed that foliar nitrogen applied at T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) recorded maximum Harvest index (11.12%) followed by T_9= N @ 1.5 kg ha^{-1} (45 DAS) (10.91%) and T_7= N @ 1.0 kg ha^{-1} (60 DAS) (10.30%) respectively. However lower (6.23%) Harvest index (%) was observed under control treatment where no foliar nitrogen was applied.

DISCUSSION

Use of nutrients like nitrogen or phosphorus play important role for the production of sesame in terms of different desired characters[7]. However, it is important that nutrients must be applied in optimum amount for the best results[8].

Quantifying the optimum fertilizer rate accurately is essential to maximum the profitability and minimizes the potential negative environmental impacts (choudary and Sarwar, 1999). As stated in some previous studies the economic optimum N rate (EONR) was closely related to the fertilizer N price value ratio[9].

The results revealed that the effect of various foliar nitrogen application methods on the growth and seed yield of sesame varieties was significant difference was recorded for all the traits recorded. the extreme plant height (122.38 cm) was recorded in T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) followed by (119.28 cm) in T_9= N @ 1.5 kg ha^{-1} (45 DAS) however the lowest plant height was recorded in T_1= N @ 00 kg ha^{-1} (control) (80.57 cm), whereas for the trait branches $plant^{-1}$ the maximum number of branches $plant^{-1}$ was counted in T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) (34.45) followed by T_7= N @ 1.0 kg ha^{-1} (60 DAS) (33.94) however the lowest number of branches were counted in T_1= N @ 00 kg ha^{-1} (control) (15.47), as far as the character capsules $plant^{-1}$ is concerned the maximum capsules were counted in T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) and T_7= N @ 1.0 kg ha^{-1} (60 DAS) (194.60 and 191.48) and lowest number of capsules were counted in T_1= N @ 00 kg ha^{-1} (control) (130.31), the maximum capsule length (cm) were measured in T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) and T_9= N @ 1.5 kg ha^{-1} (45 DAS) (2.65 and 2.63cm) however the minimum length was recorded in T_1= N @ 00 kg ha^{-1} (control) (1.30 cm), the maximum seeds $capsules^{-1}$ was counted in T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) and T_9= N @ 1.5 kg ha^{-1} (45 DAS) (56.3 and 52.9) minimum seeds $capsules^{-1}$ were counted in T_1= N @ 00 kg ha^{-1} (control) (30.5), the highest in seed wt $plant^{-1}$(g) was weighed T_7= N @ 1.0 kg ha^{-1} (60 DAS) followed by T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) (76.31 and 71.02 g) however the minimum length was recorded in T_1= N @ 00 kg ha^{-1} (control) (50.57 g), the maximum seed index (1000 seed wt g) was weighed in T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) (5.69g) followed T_9= N @ 1.5 kg ha^{-1} (45 DAS) (5.66g) however the lowest weight was by T_1= N @ 00 kg ha^{-1} (control) (3.34g). The maximum seed yield (kg ha^{-1}) was weighed in T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) (1233.3) followed by T_7= N @ 1.0 kg ha^{-1} (60 DAS) (1181.7) whereas the lowest seed yield (kg ha^{-1}) was recorded in T_1= N @ 00 kg ha^{-1} (control) (711.7) and for the trait harvest index (%) in T_{10}= N @ 1.5 kg ha^{-1} (60 DAS) and T_9= N @ 1.5 kg ha^{-1} (45 DAS) (11.12 and 10.91%) and lowest harvest index percentage was recorded in T_1= N @ 00 kg ha^{-1} (control) (6.23).

4. CONCLUSIONS

It was exhibited that under control plot where without nitrogen treatment, lowest plant height was observed. Also, under control lower branches of plant, lower capsules length, lower seed weight and lower seed capsules were achieved. Moreover, lower seed index was observed under control. Furthermore, lower seed yield, lower harvest index was observed under control. Hence, overall it was found that all the growth and yield parameters of sesame showed the positive response of foliar application at the rate 1.5g @ 60 DAS.

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CONFLICT OF INTEREST

All authors declare no conflict of interest regarding this article.

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